CLAIMS

Ins. C1

1. A micro flow system for separating particles, comprising a member having

a flow channel defined therein for guiding a flow of a fluid containing the particles through the flow channel,

first inlet means positioned at one end of the flow channel for entering the fluid into the flow channel,

first outlet means positioned at the other end of the flow channel for discharging the fluid from the flow channel,

the flow of the fluid containing the particles being controlled in such a way that one particle at the time passes a cross-section of the flow channel,

the member being positioned in a field that is substantially perpendicular to a longitudinal axis of the flow channel so that particles residing in the flow channel and being susceptible to the field across the flow channel are deflected in the direction of the field.

2. A micro flow system according to claim 1, wherein the member further comprises field generating means positioned proximate to the flow channel for generating a field substantially perpendicular to a longitudinal axis of the flow channel.

3. A micro flow system according to claim 1 ~~or 2~~, further comprising monitoring means positioned at the flow channel for monitoring parameters of a particle residing within a measurement volume within the flow channel and providing an output signal corresponding to a monitored parameter.

4. A micro flow system according to claim 3, wherein the monitoring means comprise optical detection means for monitoring optical parameters of a particle residing within a measurement volume within the flow channel and providing an output signal corresponding to an optical parameter.

5. A micro flow system according to claim 3 ~~or 4~~, wherein the monitoring means comprise a Hall sensor for measurement of a magnetic parameter of a magnetic particle within a specific volume of the flow channel.

6. A micro flow system according to ~~any of claims 3-5,~~ further comprising field generating control means for controlling the strength of the field generated by the field generating means in response to the output signal of the monitoring means whereby particles are separated according to values of a parameter monitored by the monitoring means.

7. A micro flow system according to ~~any of the preceding claims~~, wherein the Reynolds number of the flow of the fluid containing the particles through the channel is in the range of 0.01-500, preferably in the range of 0.05-50, in particular in the range of 0.1-25.

8. A micro flow system according to ~~any of claims 1-6,~~ wherein the lowest cross-sectional area of the flow channel is in the range of 0.004-0.11 mm^2.

9. A micro flow system according to ~~any of the preceding claims~~, further comprising second outlet means for discharging particles having been deflected in the flow channel.

10. A micro flow system according to ~~any of the preceding claims~~, wherein the field generating means comprises a magnet.

11. A micro flow system accoding to claim 10, wherein the field generating means further comprise ferrite members positioned at the flow channel for focussing of a magnetic field.

12. A micro flow system according to ~~any of the preceding claims~~, wherein the field generating means comprises an electrode.

13. A micro flow system according to ~~any of the preceding claims,~~ wherein positions in relation to the flow channel of the field generating means are adjustable for adjustment of the strength of the field across the flow channel.

14. A micro flow system according to ~~any of the preceding claims,~~ further comprising flow speed adjustment means for adjustment of the time the particles reside in the flow channel.

15. A micro flow system according to ~~any of the preceding claims~~, further comprising a cover for covering the flow channel.

16. A micro flow system according to claim 15, wherein the cover is a transparent or translucent cover allowing optical monitoring of the flow channel.

17. A micro flow system according to ~~any of the preceding claims~~ claim 1, further comprising second inlet means for entering a first guiding buffer, the cross-section and the path through the flow channel of the flow of the fluid containing particles being controlled by the first guiding buffer flow.

18. A micro flow system according to claim 17, further comprising third inlet means for entering a second guiding buffer, the cross-section and the path through the flow channel of the flow of the fluid containing particles being controlled by the first and second guiding buffer flows that surround the flow of the fluid containing particles.

19. A micro flow system according to claim 18, wherein the width and the position of the flow of fluid containing particles is controlled by adjustment of the volumetric ratio between the fluid flow rate and the flow rate of the guiding buffers.

20. A micro flow system according to ~~any of the preceding claims~~ claim 1, wherein the deflected particles comprise living cells.

21. A micro flow system according to ~~any of the preceding claims~~ claim 1, wherein the deflected particles comprise beads, microspheres, chromosomes, organelles, biomolecules, or proteins.

22. A micro flow system according to ~~any of the preceding claims~~ claim 1, wherein the deflected particles have been magnetically, chromophorically, or fluorescently stained.

23. A micro flow system according to ~~any of the preceding claims~~, comprising a plurality of outlets for discharging of particles separated according to their different susceptibility to the field across the flow channel.

24. A micro flow system according to ~~any of the preceding claims~~ claim 1, wherein the member further comprises pre-treatment and/or post-treatment facilities.

25. A micro flow system according to claim 24, wherein the pre-treatment facilities comprise incubation means for preparing or pre-reacting ~~the fluid~~ comprising the particles.

26. A micro flow system according to claim 24 ~~or 25~~, wherein the pre-treatment facilities comprise means for magnetic, fluorescent, or chromophoric staining.

27. A micro flow system according to claim 24, wherein the post-treatment facilities comprise means for collecting or concentrating the deflected particles.

28. A micro flow system according to claim 24, wherein the post-treatment facilities comprise means for bringing the deflected particles into contact with one or more reagent(s).

29. A micro flow system for separating particles, comprising a member having

a flow channel defined therein for guiding a flow of a fluid containing the particles through the flow channel,

first inlet means positioned at one end of the flow channel for entering the fluid into the flow channel,

first and second outlet means positioned at the other end of the flow channel for discharging of fluid from the flow channel,

the flow of the fluid containing the particles being controlled in such a way that one particle at the time passes a cross-section of the flow channel,

monitoring means positioned at the flow channel for monitoring parameters of a particle residing within a measurement volume within the flow channel and providing an output signal corresponding to a monitored parameter,

control means for controlling passage of fluid through the first and the second outlet means, respectively, in response to the output signal of the monitoring means whereby particles may be separated according to values of a parameter monitored by the monitoring means.

30. A micro flow system for separating particles, comprising a member having

a flow channel defined therein for guiding a flow of a fluid containing the particles through the flow channel,

inlet means positioned at ~~one end of the~~ flow channel for entering the fluid into the flow channel,

field generating means positioned proximate to the other end of the flow channel for generating a field substantially along a longitudinal axis of the flow channel whereby the particles are drawn by the field along the channel and distributed according to their susceptibility to the field and their mobility.

31. A micro flow system for analysing components of a fluid, comprising a member having a flow channel defined therein for guiding a flow of a fluid through the flow channel, first inlet means for entering particles into the flow channel, first outlet means for discharging of fluid from the flow channel and a plurality of assay sites located in the flow channel and comprising immobilised reagents whereby the fluid may be analyzed for a plurality of components while residing in the flow channel.

32. A micro flow system according to claim 31, further comprising field generating means positioned proximate to at least some of the assay sites for generation of a field proximate to the corresponding assay site whereby reagents residing in the flow channel and being susceptible to the field when generated at a selected assay site are attracted to and immobilised at the selected assay site, or, are rejected from the selected assay site.

33. A micro flow system according to claim 31 ~~or 32~~, wherein the member comprises a plurality of flow channels arranged in parallel or in series and each of which has assay sites whereby the fluid containing particles is brought into contact with a large number of assay sites.

34. A method of separating particles, comprising the steps of

guiding a flow of a fluid containing the particles through a flow channel in such a way that one particle at the time passes a cross-section of the flow channel,

positioning the flow channel in a field that is substantially perpendicular to a longitudinal axis of the flow channel so that particles residing in the flow channel and being susceptible to the field across the flow channel are deflected in the direction of the field and thereby separated from the fluid.

35. A method of separating fetal cells from maternal cells, comprising the steps of

selective magnetically staining of fetal cells in a fluid containing fetal and maternal cells,

guiding a flow of the fluid containing the fetal cells through a flow channel in such a way that one fetal cell at the time passes a cross-section of the flow channel,

positioning the flow channel in a magnetic field that is substantially perpendicular to a longitudinal axis of the flow channel so that magnetically stained fetal cells residing in the flow channel are deflected in the direction of the magnetic field.

36. A method of separating cancer cells from other cells, comprising the steps of

selective magnetically staining of cancer cells in a fluid containing cancer and other cells,

guiding a flow of the fluid containing the cancer cells through a flow channel in such a way that one cancer cell at the time passes a cross-section of the flow channel,

positioning the flow channel in a magnetic field that is substantially perpendicular to a longitudinal axis of the flow channel so that magnetically stained cancer cells residing in the flow channel are deflected in the direction of the magnetic field.

37. A method of separating particles, comprising the steps of

guiding a flow of a fluid containing the particles through a flow channel in such a way that one particle at the time passes a cross-section of the flow channel, the flow channel having first and second outlet means for discharging of fluid from the flow channel,

monitoring parameters of a particle residing within a measurement volume within the flow channel and

controlling passage of fluid through the first and the second outlet means, respectively, in response to a monitored parameter value whereby particles may be separated according to values of a monitored parameter.

38. A method of analysing components of a fluid, comprising the steps of entering a fluid containing the particles into a flow channel and allowing the fluid to flow in the channel, the channel having a plurality of assay sites, each of which comprises immobilised reagents whereby the fluid can be analyzed for a plurality of components while residing in the channel.

39. A method of forming assay sites comprising immobilised reagents in a flow channel, comprising the steps of

preparing selected surfaces of the assay sites for immobilisation of selected reagents,

dispensing a selected reagent proximate to a corresponding selected assay site, and

generating a field proximate to the selected site whereby the reagent is attracted towards and brought into contact with the surface of the selected assay site by the field generated and is immobilised upon contact with the surface.